CLAIMS

1. A method for staggercasting, comprising the steps of:

encoding a first signal representing content using at least source encoding generating successive independent decoding segments;

encoding a second signal representing the content using at least source encoding generating successive independent decoding segments respectively corresponding to the independent decoding segments of the first encoded signal;

generating a composite signal comprising the first and second encoded signals, wherein the first encoded signal is delayed with respect to the second encoded signal; and

if an error is detected in the composite signal during at least a portion of an independent decoding segment of the delayed first encoded signal, decoding the corresponding independent decoding segment of the received second encoded signal to reproduce the content, otherwise, decoding the received delayed first encoded signal to reproduce the content.

2. The method of claim 1 wherein:

each independent decoding segment has a time duration; and

in the generating step, the first encoded signal is delayed by the time duration with respect to the second encoded signal.

3. The method of claim 1 wherein the content is video, and further comprising the step of smoothing the video image during a transition between decoding one of the received delayed first and second encoded signals and the other one of the received delayed first and second encoded signals.

4. The method of claim 3 wherein the smoothing step comprises the step of gradually changing the quality of the video image during the transition.

5. The method of claim 3 wherein the smoothing step includes introducing hysteresis for transitions.

6. The method of claim 1 wherein the steps of encoding of the first and second content representative signals comprises the steps of providing respective source encoded signals having a clear identification of the independent decoding segments.

7. The method of claim 6 wherein the content is video and the step of encoding one of the first and second video signals comprises the step of source encoding the content representative signal to provide a source encoded signal in which the successive independent decoding segments comprise a group of pictures, which group of pictures may be decoded independently, and the source encoded signal comprises a clear identification of picture boundaries and a clear identification of which coded pictures are used as reference pictures in the coding of later pictures.

8. The method of claim 7 wherein the step of encoding the one of the first and second video signals comprises the step of source encoding the video representative picture using Motion Picture Experts Group (MPEG 2) video compression encoding in which each independent decoding segment is delimited by an intra-coded (I) picture.

9. The method of claim 6 wherein the content is video and the step of encoding one of the first and second video signals comprises the step of source encoding the content representative signal to provide a source encoded signal in which successive independent decoding segments comprise an instantaneous decoding refresh (IDR) frame and slice data, which independent decoding segment may be decoded independently, and the source encoded signal comprises a clear indication of the instantaneous decoding refresh frame.

10. The method of claim 9 wherein the step of encoding the one of the first and second video signals comprises the step of source encoding the video

representative picture using joint video team (JVT) video compression encoding in which each independent decoding segment is delimited by an instantaneous decoding refresh frame.

11. The method of claim 1 wherein the step of encoding the first content representative signal comprises the step of generating a first encoded signal which is backwards compatible and the step of encoding the second content representative signal comprises generating a second encoded signal which is robust relative to the encoding of the first content representative signal.

12. The method of claim 1 wherein steps of encoding the first and second encoded signals further comprises the steps of system encoding the source encoded content representative signal and channel encoding the system encoded content representative signal.

13. The method of claim 12 wherein the step of encoding the first encoded signal comprises the step of channel encoding the system encoded content representative signal using 8-VSB modulation.

14. The method of claim 13 wherein:

the step of source encoding the first encoded signal comprises the step of encoding the content representative signal using MPEG 2 coding; and

the step of system encoding the first encoded signal comprises the step of packetizing the source encoded content representative signal using MPEG 2 format packets.

15. The method of claim 12 wherein the step of encoding the second encoded signal comprises the step of channel encoding the system encoded content representative signal using one of 4-VSB or 2-VSB modulation.

16. The method of claim 15 wherein:

the step of source encoding the second encoded signal comprises the step of encoding the content representative signal using JVT coding; and

the step of system encoding the second encoded signal comprises the step of packetizing the source encoded content representative signal using MPEG 2 format packets.

17. A method for staggercasting, comprising the steps of:

encoding a first signal representing a video signal comprising successive video pictures;

encoding a second signal representing the video signal;

generating a composite signal comprising the first and second encoded signals, wherein the first encoded signal is delayed with respect to the second encoded signal; and

decoding the first encoded signal to generate a first received video signal comprising successive video pictures;

decoding the second encoded signal to generate a second received video signal comprising successive video pictures respectively corresponding to the video pictures in the first received video signal; and

if an error is detected in the composite signal during at least a portion of the delayed first encoded signal corresponding to one of the successive video pictures, producing the corresponding one of the video pictures from the second encoded signal, otherwise producing the one of the video pictures from the first encoded signal.

18. The method of claim 17 wherein:

each video picture has a time duration; and

in the generating step, the first encoded signal is delayed by one or more time durations with respect to the second encoded signal.

19. The method of claim 17 further comprising the step of smoothing the video image during a transition between decoding the received second encoded signal and the received delayed first encoded signal.

20. The method of claim 19 wherein the smoothing step comprises the step of gradually changing the quality of the content during the transition.

21. The method of claim 19 wherein the smoothing step includes introducing hysteresis for transitions.

22. The method of claim 17 wherein the step of encoding one of the first and second video signals comprises the steps of source encoding the content representative signal to provide respective a source encoded signal having a clear identification of the video pictures.

23. The method of claim 22 wherein the step of source encoding the one of the first and second video signals comprises the step of source encoding the video signal using Motion Picture Experts Group (MPEG 2) video compression encoding in which each independent decoding segment is delimited by an intra-coded (I) picture.

24. The method of claim 22 wherein the step of source encoding the one of the first and second video signals comprises the step of source encoding the video signal using joint video team (JVT) video compression encoding in which each independent decoding segment is delimited by an instantaneous decoding refresh picture.

25. The method of claim 17 wherein:

the steps of decoding the first and second encoded signals each comprise the step of storing decoded video pictures for further processing; and

if an error is detected in the composite signal during at least a portion of the delayed first encoded signal corresponding to one of the successive video pictures, storing the corresponding decoded video picture from the other one of the first and second video signals, otherwise storing the corresponding video picture from the one of the first and second decoded video signals.

26. The method of claim 17 wherein steps of encoding the first and second encoded signals comprises the steps of source encoding the content representative signal, system encoding the source encoded content representative signal, and channel encoding the system encoded content representative signal.

27. The method of claim 26 wherein the step of encoding the first encoded signal comprises the step of channel encoding the system encoded content representative signal using 8-VSB modulation.

28. The method of claim 27 wherein:

the step of source encoding the first encoded signal comprises the step of encoding the content representative signal using MPEG 2 source encoding; and

the step of system encoding the first encoded signal comprises the step of packetizing the source encoded content representative signal using MPEG 2 format packets.

29. The method of claim 26 wherein the step of encoding the second encoded signal comprises the step of channel encoding the system encoded content representative signal using one of 4-VSB or 2-VSB modulation.

30. The method of claim 29 wherein:

the step of source encoding the second encoded signal comprises the step of encoding the content representative signal using JVT coding; and

the step of system encoding the second encoded signal comprises the step of packetizing the source encoded content representative signal using MPEG 2 format packets.

31. A staggercasting receiver, for receiving a composite signal comprising first and second encoded signals, each encoded signal representing a content representative signal and source encoded to have successive corresponding independent decoding segments, wherein the first encoded signal is delayed with respect to the second encoded signal, comprising:

a demultiplexer, responsive to the composite signal, for extracting the first and second encoded signals from the composite signal, and for generating an error signal representing an error in the composite signal;

a selector, coupled to the first and second decoders and responsive to the error representative signal, for selecting an independent decoding segment of the received second encoded signal if an error is detected in the composite signal during at least a portion of the corresponding independent decoding segment of the delayed first encoded signal, and selecting the received delayed first encoded signal otherwise; and

a decoder for source decoding the selected received encoded signal.

32. The receiver of claim 31 wherein the content representative signal is a video signal and the selector further comprises circuitry for smoothing the video image during a transition between selecting one of the first and second encoded signals and selecting the other one of the first and second encoded signals.

33. The receiver of claim 32 wherein the smoothing circuit contains circuitry for gradually changing the quality of the video image from that of one of the received video signals to that of the other one of the received video signals during the transition.

34. The receiver of claim 33 wherein the smoothing circuit comprises:

a video quality filter, coupled to receive the selected video signal, for generating a video signal having a variable video quality in response to a quality control signal; and

a selector, coupled to receive the selected video signal and the filtered video signal, and responsive to a transition control signal to couple the video quality filter to produce the filtered video signal during the transition and to produce the selected video signal otherwise.

35. The receiver of claim 32 wherein the smoothing circuit further comprises circuitry to introduce hysteresis for transitions.

36. The receiver of claim 31 wherein:

each independent decoding segment has a time duration;

in the composite signal, the first encoded signal is delayed by the time duration with respect to the second encoded signal; and

the receiver further comprises a delay, coupled between the demultiplexer and the selector, for delaying the received second encoded signal by the time duration, whereby the received first and second encoded signals are realigned in time.

37. The receiver of claim 31 wherein in the composite signal, each independent decoding segment in both the first and second encoded signals is clearly identified.

38. The receiver of claim 31 wherein:

the first encoded signal is source encoded using a first encoding technique and the second encoded signal is source encoded using a second encoding technique different from the first encoding technique; and

the decoder is a multi-standard source decoder for decoding both the first and second encoding techniques.

39. The receiver of claim 38 wherein one of the first and second source encoding techniques is Motion Picture Experts Group (MPEG 2) video compression encoding in which each independent decoding segment is a group of pictures delimited by an intra-coded (I) picture.

40. The receiver of claim 38 wherein one of the first and second source encoding techniques is joint video team (JVT) video compression encoding in which each independent decoding segment is delimited by an instantaneous decoding refresh frame.

41. The receiver of claim 31 wherein the first encoded signal is backwards compatible and the second encoded signal is robust relative to the first encoded signal.

42. The receiver of claim 31 wherein the first and second encoded signals are further system encoded and channel encoded, and further comprising:

a channel decoder, responsive to the composite signal, for demodulating the first encoded signal using 8-VSB demodulation, and for demodulating the second encoded signal using one of 4-VSB or 2-VSB demodulation; and

the decoder further system decodes the channel decoded first and second encoded signals before source decoding the first and second encoded signals.

43. A staggercasting receiver, for receiving a composite signal comprising a first and second encoded signal, wherein each encoded signal represents a video signal having successive video pictures and the first encoded signal is delayed with respect to the second encoded signal, comprising:

a demultiplexer, responsive to the composite signal, for extracting the first and second encoded signals from the composite signal, and generating an error signal representing an error in the composite signal;

a first decoder, responsive to the extracted first encoded signal, for generating a first received video signal comprising successive video pictures;

a second decoder, responsive to the extracted second encoded signal for generating a second received video signal comprising successive video pictures; and

a selector, coupled to the first and second decoders and responsive to the error signal, for producing a video picture from the second encoded signal if an error is detected in the composite signal during at least a portion of the delayed first encoded signal corresponding to the video picture, and producing the corresponding video picture from the first encoded signal otherwise.

44. The receiver of claim 43 wherein the selector further comprises circuitry for smoothing the video image during a transition between selecting one of the first and second encoded signals and selecting the other one of the first and second encoded signals.

45. The receiver of claim 44 wherein the smoothing circuit contains circuitry for gradually changing the quality of the video image from that of one of the received

video signals to that of the other one of the received video signals during the transition.

46. The receiver of claim 45 wherein the smoothing circuit comprises:

a video quality filter, coupled to receive the selected video signal, for generating a video signal having a variable video quality in response to a quality control signal; and

a selector, coupled to receive the selected video signal and the filtered video signal, and responsive to a transition control signal to couple the video quality filter to produce the filtered video signal during the transition and to produce the selected video signal otherwise.

47. The receiver of claim 44 wherein the smoothing circuit further comprises circuitry to introduce hysteresis for transitions.

48. The receiver of claim 43 wherein:

each video picture has a picture period;

in the composite signal, the first encoded signal is delayed by a time duration of one or more picture periods with respect to the second encoded signal; and

the receiver further comprises a delay device coupled between the demultiplexer and the second decoder, for delaying the received second encoded signal by the time duration, whereby the received first and second encoded signals are realigned in time.

49. The receiver of claim 43 wherein in the composite signal, each video picture in both the first and second encoded signals is clearly identified.

50. The receiver of claim 43 wherein the first encoded signal is encoded using a first encoding technique and the second encoded signal is encoded using a second encoding technique different from the first encoding technique.

51. The receiver of claim 50 wherein one of the first and second encoded signals is source encoded using Motion Picture Experts Group (MPEG 2) video compression encoding, and the corresponding one of the first and second decoders comprises an MPEG 2 source decoder.

52. The receiver of claim 50 wherein one of the first and second encoded signals is source encoded using joint video team (JVT) video compression encoding, and the corresponding one of the first and second decoders comprises a JVT source decoder.

53. The receiver of claim 43 wherein the first encoded signal is backwards compatible and the second encoded signal is robust relative to the first encoded signal.

54. The receiver of claim 53 wherein:

the first encoded signal is channel encoded using 8-VSB modulation and the second encoded signal is channel encoded using one of 4-VSB or 2-VSB modulation; and

the receiver further comprises a channel decoder for decoding the first encoded signal using an 8-VSB demodulator and the second encoded signal using one of a 4-VSB or 2-VSB demodulator.

55. The receiver of claim 54 wherein:

the first encoded signal is further source encoded using MPEG 2 source encoding and system encoded using MPEG 2 packet formats and the second encoded signal is further source encoded using JVT source encoding and system encoded using MPEG 2 packet formats;

the first decoder comprises an MPEG 2 system decoder and an MPEG 2 source decoder; and

the second decoder comprises an MPEG 2 system decoder and a JVT source decoder.